

CLAIMS

1. A force feedback method for presenting
a force sense to an operator by jetting gas or
5 liquid from a nozzle of jetting means according to a
position or an orientation of a receiver, wherein
the receiver is provided with an inclined side
surface unit shaped to be inclined, outward from a
center part of the receiver, with respect to an axis
10 line of the receiver, comprising:
providing a force, to the receiver,
including a component perpendicular to a jet
direction of the gas or the liquid by jetting the
gas or the liquid to the incline side surface unit.
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2. The force feedback method as claimed in
20 claim 1, wherein a position or an orientation of the
inclined side surface unit is changed according to
the position or the orientation of the receiver.

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3. The force feedback method as claimed in
claim 1 or 2, comprising:
calculating a virtual object according to
30 the position or the orientation of the receiver so
as to display a virtual space including the virtual
object based on a result of the calculation.

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4. The force feedback method as claimed in

claim 1, wherein the jetting means has a structure where a plurality of nozzles are arranged on a plane, and the receiver is placed at a predetermined height on the plane, the force feedback method comprising:

5 selecting a nozzle that is positioned between an inner border of the inclined side surface unit of the receiver and an outer border of the inclined side surface unit wherein an angle difference between a direction from the nozzle to
10 the center of the receiver and a direction of the force to be provided to the receiver is equal to or less than a predetermined value; and
 jetting the gas or the liquid from the selected nozzle.

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5. A force feedback apparatus used for a
20 force feedback method for presenting a force sense to an operator by jetting gas or liquid from a nozzle of jetting means according to a position or an orientation of a receiver, comprising:

 jet control means for controlling a jet
25 amount or a jet direction of the gas or the liquid jetted from the nozzle of the jetting means according to a position or an orientation of the receiver measured by receiver measurement means that is connected to the force feedback apparatus,

30 wherein the receiver is provided with an inclined side surface unit shaped to be inclined, outward from a center part of the receiver, with respect to an axis line of the receiver, and

 the jet control means controls the jetting
35 means so as to jet the gas or the liquid to the inclined side surface unit in order to provide a force, to the receiver, including a component

perpendicular to a jet direction of the gas or the liquid.

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6. The force feedback apparatus as claimed in claim 5, wherein the receiver is provided with a deformation mechanism for changing a position or an orientation of the inclined side surface unit, the force feedback apparatus further comprising receiver side surface unit control means for controlling the deformation mechanism according to the position or the orientation of the receiver measured by the receiver measurement unit.

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7. The force feedback apparatus as claimed in claim 5 or 6, comprising:

virtual object calculation means for calculating a virtual object in a virtual space according to the position or the orientation of the receiver measured by the receiver measurement means, and causing virtual object display means to display the virtual space including the virtual object based on a result of the calculation.

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8. The force feedback apparatus as claimed in claim 5, wherein, when the jetting means has a structure where a plurality of nozzles are arranged on a plane, and the receiver is placed at a predetermined height on the plane,

the jet control means selects a nozzle that is positioned between an inner border of the inclined side surface unit of the receiver and an outer border of the inclined side surface unit
5 wherein an angle difference between a direction from the nozzle to a center of the receiver and a direction of the force to be provided to the receiver is equal to or less than a predetermined value, and causes the selected nozzle to jet the gas
10 or the liquid in order to provide a force, to the receiver, including a component perpendicular to a jet direction of the gas or the liquid.

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9. A program for causing a computer to realize functions of a force feedback apparatus used for a force feedback method for presenting a force
20 sense to an operator by jetting gas or liquid from a nozzle of jetting means according to a position or an orientation of a receiver, the program causing the computer to function as:

jet control means for controlling a jet
25 amount or a jet direction of the gas or the liquid jetted from the nozzle of the jetting means according to a position or an orientation of the receiver measured by receiver measurement means that is connected to the computer,

30 wherein the receiver is provided with an inclined side surface unit shaped to be inclined, outward from a center part of the receiver, with respect to an axis line of the receiver, and

the jet control means controls the jetting
35 means so as to jet the gas or the liquid to the inclined side surface unit in order to provide a force, to the receiver, including a component

perpendicular to a jet direction of the gas or the liquid.

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10. The program as claimed in claim 9,
wherein the receiver is provided with a deformation
mechanism for changing a position or an orientation
10 of the inclined side surface unit, the program
further causing the computer to function as receiver
side surface unit control means for controlling the
deformation mechanism according to the position or
the orientation of the receiver measured by the
15 receiver measurement unit.

20 11. The program as claimed in claim 9 or
10, the program further causing the computer to
function as:

virtual object calculation means for
calculating a virtual object in a virtual space
25 according to the position or the orientation of the
receiver measured by the receiver measurement means,
and causing virtual space display means to display
the virtual space including the virtual object based
on a result of the calculation.

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12. The program as claimed in claim 9,
35 wherein, when the jetting means has a structure
where a plurality of nozzles are arranged on a plane,
and the receiver is placed at a predetermined height

on the plane,

the jet control means selects a nozzle
that is positioned between an inner border of the
inclined side surface unit of the receiver and an
5 outer border of the inclined side surface unit
wherein an angle difference between a direction from
the nozzle to a center of the receiver and a
direction of the force to be provided to the
receiver is equal to or less than a predetermined
10 value, and causes the selected nozzle to jet the gas
or the liquid in order to provide a force, to the
receiver, including a component perpendicular to a
jet direction of the gas or the liquid.

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